We have efficacy but lack infrastructure: teachers' views on online teaching learning during COVID-19

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Abstract

Purpose – The coronavirus (COVID-19) pandemic led education institutions to move all face-to-face (F2F) courses online. The situation is unique in that teachers and students can make a direct comparison of their courses before (F2F) and after COVID-19 (online). This study aims to analyze teachers' viewpoints for this unprecedented change.

Design/methodology/approach – The study followed a mixed-method approach within an ex post facto survey research design. Research tools were distributed among 200 Indian secondary school teachers following a heterogeneous purposive sampling technique. As the study was conducted during the pandemic backdrop researchers used Google forms and telephonic interviews to collect data.

Findings – Teachers viewed positively to this shift from F2F to online teaching-learning (OTL). They were found to have an overall moderate level of online teaching efficacy and where good efficacy prevails there found minimal concern for infrastructure, an attitude showing least concern for “what is not” and more concerned with “what they can do with what is having.” A statistically significant effect of teacher efficacy was found on their perception of OTL infrastructure that supports this strong conviction among few teachers. Statistical analysis revealed for every 1 standard unit increase in self-efficacy, the perceived OTL infrastructure was to be increased by 0.997 standard units which support the strong correlation between the two chosen cognitive variables ($r = 0.8$). Besides, teachers were not found as a homogeneous group concerning their reported readiness for online teaching yet, different subgroups of teachers exist which may require different approaches for support and counseling.

Originality/value – The paper reports an original empirical survey conducted in India and the write-up is based strictly on the survey findings only. An exclusive analysis of teachers' views of their efficacy and perceived OTL infrastructure. At the same time, path-breaking in analyzing the chemistry between the two variables which will help improving apposite culture, practice and understanding of the digital pedagogy securing quality OTL in the long run.

Keywords OTL, Teacher efficacy, Perceived OTL infrastructure, ICT, School teachers, India

Paper type Research paper

Introduction

With coronavirus (COVID-19), the world has been facing a new existential enemy and the nations contentiously must again summon its educational, moral and scientific might to fight it back because it has brought a time of social distancing, not mental. Starting from

Ethical approval: This study was made based on an on-line survey and hence, no institutional approval was associated with this research.

Conflict of interest: The authors hereby declare that there have no conflicts of interest.

China, the deadly COVID-19 has already taken up the whole world into its capture compelling the World Health Organization (WHO) to declare it as a pandemic disaster on March 11, 2020 (WHO, 2020) and almost the whole world has put under house arrest. This sudden pandemic outbreak of COVID-19 has put a massive impact on the education sector globally and the gust is most acute in developing countries like India where online teaching-learning (henceforth OTL) infrastructure was not thriven up to the satisfactory mark, naturally, teaching-learning had a massive loss during this prolong school closure. Kundu and Bej (2021) said suggestions for improving digital education revolve around four areas which suggest that pupils from marginal socioeconomic households were significantly disadvantaged during the COVID-19-driven virtual education scheme. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2020f) calls up all nations to resort to online modules on an emergency basis, as this prolonged school closure has shed a light on numerous issues affecting students' satisfaction, access to education, as well as broader socio-economic issues raising many questions on the conventional practices and attitudes in every sphere ranging from politics to education (UNESCO, 2020b). As of April 18, 2020, approximately 1.725 billion learners globally have been affected due to school closures resulting out of the pandemic, according to UNESCO monitoring, 192 countries have implemented nationwide closures and 5 have implemented local closures, impacting about 99.9% of the world's student population (UNESCO, 2020a). In India, on 16th March the union government declared a countrywide lockdown of schools and colleges, pushing millions of students out of institutional education (Sanyal, 2020). The report further said this lockdown has affected academic activities at various levels, including the postponement of board exams, college exams and even national level entrance exams and online classes have been the only resort that the government has recommended for the institutions to continue education in a sloth rate adopting several arrangements, including online portals and educational channels through Direct to Home TV, for students to continue learning. According to a survey among Indian parents in March 2020, a majority of respondents were found favoring schools remaining closed as a precautionary measure till medicative intervention arrives (Jaganmohan, 2020), but in this context authors found in a separate survey "that students were neither satisfied nor ready for this sudden shift toward online education rather they felt fear, uncertainties and several challenges owing to a deep digital divide to adapt to this unprecedented shift and they were found absorbed in memories of face-to-face (F2F) mode before the COVID-19 outbreak and take this online shift as a temporary adjustment owing to respond to the pandemic finding no possible alternate" (Kundu and Bej, 2020, p. 1). The current study was an effort to investigate the views of Indian school teachers to this unprecedented situation, how they have been responding to the situation amidst several unprecedented insufficiencies and how far teachers' self-efficacy is potent to bring positive changes in them to fight back the undeveloped OTL infrastructure.

Online teaching learning becomes a compulsion

Efforts to stem the spread of COVID-19 through non-pharmaceutical interventions, preventive measures such as social distancing and self-isolation have prompted the widespread closure of primary, secondary and tertiary schooling in over 100 countries (UNESCO, 2020b). As closures tend to occur concurrently with other interventions such as public gathering bans, it can be difficult to measure the specific impact of school closures (Jackson *et al.*, 2013). However, it is the only possible way the whole world using resulting in more than 370 million children and youth are not attending school because of temporary or indefinite country wide school closures mandated by governments in an attempt to slow the spread of COVID-19 (Zussman and Little, 2020, March 17). As of 29th March, nearly 90% of

the world's learners were impacted by school closures (UNESCO, 2020b). Even when school closures are temporary, it carries high social and economic costs as such localized school closures place burdens on schools as parents and officials redirect children to open schools, the disruptions they cause affect people across communities, but their impact is more severe for disadvantaged children and their families including interrupted learning, compromised nutrition, childcare problems and consequent economic cost to families who cannot work (UNESCO, 2020e). Thus, the negative consequences of the COVID-19 outbreak are very vast and august, therefore, Ms. *Audrey Azoulay*, the Director-General of UNESCO said continuity of learning is essential forgetting drills, ignoring all negativities and pulling out all stops (UNESCO, 2020c). Responding to these school closures, UNESCO recommended the use of OTL platforms as a compulsion that schools and teachers can use to reach learners remotely and limit the disruption of education (UNESCO, 2020d). Several other studies are also recommended in this direction (Karp and McGowan, 2020; Jordan, 2020). This resulted in a rapid transition to OTL between March to May 2020 for most educational institutions around the world, independent of whether teachers were prepared or not (UNESCO, 2020f). This rapid transition of all teaching consequently provides a unique opportunity to observe the extent to which teachers felt prepared for OTL (Brooks and Grajek, 2020). Before COVID-19 the importance and effectiveness of information and communication technology (ICT) enabled OTL was time tested, making it a potent tool for creating, collecting, sharing, storing, motivating, strengthening communication and collaboration, as several past studies have shown (Minty and Pather, 2014; Nkula and Krauss, 2014; Chigona, 2015; Kundu, 2018; Bindu, 2019). Numerous studies have indicated that the introduction of ICTs for educational purposes has the potential to bring positive changes to teaching and learning practices (Kundu and Bej, 2020b). However, it was so far deemed optional, practiced by few elitist schools in India but COVID-19 has made OTL a compulsory means for all educational institutions across the globe irrespective of their infrastructure (Kundu and Bej, 2020).

Role of teacher efficacy in online teaching learning

Teacher efficacy is defined as “the teacher’s belief in his or her capability to organize and execute courses of action required to accomplish a specific teaching task in a particular context” (Tschannen-Moran and Hoy, 2001, p. 22). As teachers educate the most valued asset of the country, i.e. students, teacher efficacy has far more impact on student learning than any other factors under the control of school systems (Kuo *et al.*, 2014). The concept of “teacher efficacy” evolved from the notion of self-efficacy, a psychological construct introduced by Bandura (1977) within his “social cognitive theory (SCT). Bandura (1997) himself defined self-efficacy as an individual’s belief about being able to accomplish a specific course of action and he further said stronger their notion of self-efficacy, the greater their effort, perseverance and elasticity (Bandura, 1986), meaning a strong notion of self-efficacy, in turn, creates feelings of tranquility and provides power to challenge at the face of difficult tasks. Teo (2009) said it is almost impossible to explain characteristics of human functioning such as motivation, attitude, achievement, learning and self-regulation without self-efficacy. Self-efficacy determines and controls people’s thoughts and the way they act or behave (Alqurashi, 2016). It concerns less on what skills and abilities individuals possess than his/her internal willingness to accomplish the task (Bong and Skaalvik, 2003). People who regard themselves as a highly efficacious act, think and feel differently from those who perceive themselves as inefficacious (Kundu, 2020). They produce their future, rather than simply foretell it (Pajares, 2002) implying that they have the inner potential to overcome environmental loopholes or poor outcome expectations which is the target of this study. In a country like India, it is unthinkable

that it could develop its OTL infrastructure overnight, hence, it is very pertinent to search for alternates to continue the wheels of education in this hard time. Empowering teachers internally by enhancing their OTL self-efficacy could be one such alternate. The observation of [Chiu and Tsai \(2014\)](#) made in the Asian context is worth repeating here that the places where technology inclusion is very irregular, gender disparity is very popular and skilled teachers are a rarity their self-efficacy of the participants could be a good instrument to fight amidst all these difficulties, which could provide them an intrinsic motivation to sustain in the teaching-learning activity. [Hong *et al.* \(2017\)](#) mathematically established a positive relationship between Chinese learning intrinsic motivation and online learning self-efficacy. Further, supporting this view, a lot of studies have categorically said that self-efficacy has a deep impact on the OTL participants' innovativeness, communication climate, holding strong perception toward online infrastructure, motivation, asynchronous communication, learner-learner communication or learner-teachers' communication and knowledge sharing in online mode ([Lim *et al.*, 2016](#); [Shen, 2015](#); [Kuo *et al.*, 2014](#); [Chiu and Tsai, 2014](#); [Joo *et al.*, 2013](#); [Zhang *et al.*, 2012](#); [Chu, 2010](#); [Song *et al.*, 2011](#)). [Bandura \(1997\)](#) said the self-efficacy of a person can be enhanced and he has also defined four sources of self-efficacy – performance accomplishments, vicarious experience, social persuasion and physiological and emotional states – as shown in [Figure 1](#).

Enhancing this notion of Bandura, [Kundu \(2020\)](#) has proposed a framework to enhance participants' self-efficacy for OTL along with a detailed policy framework as presented in [Figure 2](#).

Alarming digital divide affecting quality online teaching-learning in India

Following the UNESCO guidelines India also trying to move education online and the country has been witnessing an e-learning boom, classes on Zoom, WhatApps, Google meet and Skype are becoming the norms for students, parents and teachers, yet this abrupt transition to online hardly compensates for the absence of the F2F experience ([World Economic Forum, 2020](#)). Teachers and school administrators have been advised by the concerned governments to continue communication with students through virtual lectures or portals like Massive Open Online Courses, however, in the absence of physical classrooms and proper digital infrastructure, both teachers and students are facing unprecedented challenges ([Kundu, 2020](#)). [Kundu *et al.* \(2020\)](#) painted teachers with a dismal advocacy picture where they were advised in teacher preparation not to implement digital pedagogies, despite initiatives such as the “Digital India campaign.” The major challenge of remote

Figure 1.
Sources of self-efficacy in [Bandura \(1997\)](#)

Figure 2.
Framework to
strengthen
participants' self-
efficacy in online
education (in [Kundu,
2020](#))

learning is a disparity in access, the alarming digital divide – from electricity and internet connections to devices like computers or smartphones, as several past studies repeatedly mentioned ([Thirumurthy and Sundaram, 2003](#); [Bharadwaj, 2007](#); [Gupta and Haridas, 2012](#); [Prasad, 2013](#); [Netragaonkar, 2015](#); [Kundu and Dey, 2018](#); [Kundu, 2018](#); [Bindu, 2019](#)). So far, the electricity supply is concerned the country has made satisfactory progress so far and the government claims 99.9% of Indian homes have a power connection but the picture is less luminous if we look at the quality of electricity, its constancy and the number of hours for which it is available every day especially in rural areas ([IAMAI, 2019](#)). A computer would be preferable for online classes, a smartphone could also serve the purpose and here existing data shows 24% of Indians own a smartphone, only 11% of households possess any type of computer, which could include desktop computers, laptops, notebooks, palmtops or tablets ([NSO, 2019](#)). Further analysis of this government report shows even the penetration of digital technologies in India has been haphazard and exclusionary while 66% of India's population lives in villages, only a little over 15% of rural households have access to internet services. For urban households, the proportion is 42%. The digital divide is evident across class, gender, region or place of residence ([Hindustan Times, 2020a, 2020b](#)). Among the poorest 20% of households, only 2.7% have access to a computer and 8.9% to internet facilities. In the case of the top 20% of households, the proportions are 27.6% and 50.5%. The difference is apparent across states too ([Kundu, 2020](#)). The gender divide in internet usage is also stark while in 2019, 67% of men had access to the internet; this figure was only at 33% for women. The disparity is more prominent in rural India, where the figures are 72% and 28% for men and women, respectively ([IAMAI, 2019](#)). The survey also shows that among respondents who use home broadband, over 3% face cable cuts, 53% face poor connectivity and 32% face signal issues. In the case of mobile data, 40.2% face poor connectivity and 56.6% face signal issues. Sometimes, the lack of connectivity is not a technical glitch but psychological setup also plays a crucial role here ([Ojha, 2020](#)). Another recent survey reveals that at least 27% of students do not have access to smartphones or laptops to attend online classes ([India Today, 2020a](#)). [Kundu and Bej \(2021\)](#) said all these challenges, would have multiplied many-fold for younger children and

technology-skill-deficient teachers, especially in the COVID-19 situation. Such an insurmountable digital divide across the country cannot be overcome overnight and in such a backdrop the potential of teacher efficacy needs to be studied.

Literature gap

The above literature survey depicts the desperate need for online education during this pandemic along with a skeletal depiction of Indian OTL infrastructure which has been hampering the quality issues of education delivery. Time has come to think differently because insurmountable OTL infrastructure hurdles cannot be succeeded overnight, hence, we can resort to the alternate of self-efficacy of the teachers to accomplish their goal amidst all odds, as, without alternate option and necessary supportive measures, the prevailing disparity in the virtual world could translate into widening educational inequalities among learners. Indian teachers are not to sit idle and wait for the virus to leave rather they have been struggling with the limited access that they have and few interesting reporting also revealed that teachers sometimes rise on the top trees to get an internet connection in numerous remote villages of India to continue their online teaching assignment (ANI, 2020; India Today, 2020b; Hindustan Times, 2020a). This shows their efficacy, commitment and zeal to fight against the odds. This is essential to continue OTL bypassing the infrastructural barriers, for the time being, hence, its effects on the infrastructure of online education needs an in-depth empirical investigation as it is claimed theoretically in Bandura (1997), Chiu and Tsai (2014), Song *et al.* (2011) and Kundu (2020).

Theoretical framework

Self-efficacy theory is a sub-set of Bandura's (1986) SCT. In SCT Bandura viewed humans as self-organizing, proactive, self-reflecting and self-regulating rather than as reactive organisms shaped and shepherded by environmental forces or driven by concealed inner impulses (Pajares, 2002). He viewed human functioning as the product of a dynamic interplay of personal, behavioral and environmental influences where self-efficacy plays a vital role to accomplish his goal, shown in Figure 3.

The technology acceptance model (TAM) originally developed by Davis (1989) shows teachers' use of educational technology depends on several external and internal or behavioral factors. TAM was studied by several subsequent authors and different other factors have been examined so far, for example, perceived self-efficacy, facilitating

Figure 3.
Elements of SCT
model in Pajares
(2002)

conditions and systems quality, etc. (Fathema *et al.*, 2015). The latest and the third version of this TAM (TAM 3) developed by Venkatesh and Bala (2008) found a direct and positive effect of teachers' self-efficacy on their ease of technology use, hence, it has been adopted as a theoretical framework for this study presented in Figure 4.

Method

This study was conducted at a crucial time amidst an unexpected situation and a mixed approach followed. The main survey followed a descriptive survey method within an ex-post-facto research design with teachers' online efficacy as the dependent variable and teachers' perception of the current state of online infrastructure as the independent variable. Qualitative data are also reported to depict a perfect picture of the situation. The details regarding the method of research design, sample, research instruments, the procedure of data collection and statistical technique were reported herewith.

Aims

As already mentioned, this study aimed to go through the views of Indian school teachers on moving classes online responding to COVID-19 and the specific research questions (RQ) set for this study were investigated in course of this study were as follows:

- How was the state of Indian school teachers' OTL self-efficacy?
- How was the teachers' perception of the country's OTL infrastructure?
- How did teachers' self-efficacy affect their perception of OTL infrastructure?

Sites and participants

The study was conducted taking 200 purposively selected Indian secondary school teachers as samples from 50 schools who have been taking online classes during the lockdown situation

Figure 4.
TAM (TAM 3) in
Venkatesh and Bala
(2008)

owing to the COVID-19 outbreak. To be specific, the heterogeneous sampling technique was adopted because online teaching was not a general phenomenon in this country owing to several loopholes as already discussed in the literature. This sampling method allowed to include a diverse range of cases relevant here to gain as much insight from as many angles as possible. Maintaining heterogeneity of the population the researchers considered five different demographic variables – gender, age, subject taught, school management and school location. These five were deliberately chosen because in India digital divide is very alarming and these factors may have probable contribution in these digital inequalities as already discussed in the literature. The purpose of this kind of sample design is to provide as much insight as possible into the event or phenomenon under examination (Etikan and Bala, 2017). The actual names of the participants were withheld following the research ethics. Detail demographic description of the participants is presented below in Table 1.

Research tools

Self-efficacy for technology integration scale

This is a standardized scale originally developed by Wang *et al.* (2004) having 21 question items each attached with a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5), with higher scores indicating higher online teaching efficacy. The scale was adequately contextualized and translated into the local languages (Hindi and Bengali) besides its original version in English. Regrading reliability, the internal consistency measure (Cronbach's α) was found 0.92 which is of excellent degree and the face validity was determined taking the help of my supervisor and his familiar expert's circles.

Teachers' perception of ICT infrastructure questionnaire

This is also a standardized scale developed by Kundu *et al.* (2020) to examine teachers' views on online infrastructure. It is 12 items set of questions each attached with a five-point

Demographic variables	f	(%)
<i>Gender</i>		
Male	50	50
Female	50	50
<i>Age (years)</i>		
20–30	25	25
31–40	47	47
41–50	13	13
>50	15	15
<i>Subjects taught</i>		
Science	25	25
Humanities	25	25
Social science	25	25
PW	25	25
<i>School location</i>		
Rural	35	35
Urban	65	65
<i>School management</i>		
Private	22	22
Government	78	78

Table 1.
Demographic details
of the participant
teachers

Likert scale to measure participants' perception over online teaching infrastructure with higher scores indicating better perception on the item. As authors of this study were there in the development of this scale in one of their earlier studies, the translated versions were there with them. Still, expert advice was taken regarding the justification of using such a scale in an emergency like the situation of the COVID-19 pandemic. The validity was determined like the previous scale and was found good. The internal consistency (Cronbach's α) was 0.87 that was acceptable.

Interview

Additionally, a total of 30 teachers (15 from private schools and 15 from government schools) were interviewed according to a set interview protocol by the researchers over the telephone respecting social distancing to gain an in-depth understanding on the state of online teaching in their respective schools. The opinions of respondents were served the purpose to verify the data gained through questionnaires. The participants were given the opportunity to choose their preferred time and language for the interview. Interviews were audio recorded and then transcribed. The following structured questions were asked during the interview:

- Do you find sufficient infrastructure for taking online classes?
- Do you think the lack of devices and the internet is the most acute problem against students' participation in online classes?
- Do you want to mention any other problem debarring students from online classes?
- What percentage of your students attending online classes?
- Do you satisfied with the support your school providing for your online classes?
- Do you feel online classes effective during this pandemic?

Data collection

A pilot version of the surveys was initially administered to a limited number of respondents with different characteristics to establish the effectiveness of the designed tools. Testing the survey design helped ensure that the used terms were easily perceived, as well as to check for validity (i.e. the items were asking what we wanted to learn) and reliability. Then, the main survey was distributed online among 200 participants through "Google form" and through the participants' e-mails. Total 100 answered questionnaires were collected and considered for data analysis. The response rate was 50%. An interview protocol was set, standardized and placed before the participants over the telephone and digitally recorded.

Data analysis

Data were analyzed in accordance with each research approach and results were presented in several Tables. Descriptive, as well as inferential statistics and underlying relationships between the variables, were found out by computing appropriate statistics with the help of Statistical Package for the Social Sciences software (version 22). Descriptive statistics (mean and SD) were used to evaluate teachers' perception of online teaching efficacy and current state online teaching infrastructure in these schools. The regression coefficient was calculated to assess the relationships between teacher online efficacy and perception of infrastructure. The result of the quantitative correlation analysis was further supported by the qualitative data collected through interviews for convincing interpretations to add more depth in the analysis.

Results

Finding relating to request question 1

In Table 2 the descriptive statistics of teachers’ efficacy in online teaching are presented which reveals that the overall efficacy score ($M = 41.98$, $SD = 6.5$) of the Indian secondary school teachers belongs to the moderately high level.

The frequency distribution histogram of the self-efficacy scores presented in Figure 5 shows an approximately normal distribution and is slightly negatively skewed ($Skp = -0.262$) that indicates more individuals in the group score more than the average score for their group which is further explained through the Mode score ($48 > \text{Mean } (41.98)$). This brings the conclusion that teachers’ overall self-efficacy for OTL shows a trend ranging from medium to high as per the measurement scale (Minimum = 21, Maximum = 105) used in this study.

A deep analysis of reveals that Indian male teachers having better efficacy ($M = 43.67$, $SD = 6.5$) than their female counterparts ($M = 39.45$, $SD = 5.7$) and this difference is found statistically significant ($p = 0.0 > 0.05$) as per the t -test result presented in Table 3 below.

<i>N</i>	Valid	100
	Missing	0
Mean		41.98
Median		42.00
Mode		48
Std. deviation		6.533
Skewness		−0.262
Std. error of skewness		0.241
Minimum		28
Maximum		53

Table 2.
Descriptive statistics
of teachers’ self-
efficacy

Figure 5.
Histogram of self-
efficacy scores

Regarding OTL self-efficacy among four different age groups, it is found that 20–30 years age group of teachers show the best score ($M = 44.5$, $SD = 5.96$) followed by 31–40 years ($M = 43.43$, $SD = 5.9$), above 50 having the lowest efficacy ($M = 39.12$, $SD = 6.02$) and 41–50 years ($M = 37.38$, $SD = 6.9$) which is made evident in the mean plot analysis in Figure 6.

The one-way ANOVA results in Table 4 show this difference is highly statistically significant ($p = 0.001 < 0.05$).

Further, as the above ANOVA found statistically significant a post hoc comparison was also conducted and the results are presented in Table 5 below to find which group is significantly perceived higher score than other groups. The data does not meet the assumption of homogeneity of variances as per Levene’s statistics ($p = 0.56 > 0.05$), hence, the Games Howell test post hoc test was used.

The above post hoc analysis displays that the differences between the groups 20–30 years and 41–50 years ($p = 0.04 < 0.05$), 20–30 years and >50 years ($p = 0.007 < 0.05$) and

Table 3.
t-test comparing the difference of OTL efficacy between male and female teachers

		Levene’s test for equality of variances		t-test for equality of means				
Variable		F	Sig.	<i>t</i>	<i>df</i>	Sig. (two-tailed)	Mean difference	Sth. error difference
Teacher self-efficacy	Equal variances assumed	3.42	0.07	3.32	98	0.001*	4.217	1.271
	Equal variances not assumed			3.41	90.89	0.001	4.217	1.238

Note: * $p < 0.05$

Figure 6.
Mean plots of age group wise teachers’ self-efficacy

above 50 years ($p = 0.04 < 0.05$) are statistically significant. On the other hand, the difference between 20–30 years and 31–40 years ($p = 0.89 > 0.05$), 31–40 years and 41–50 years ($p = 0.1 > 0.05$), above 50 and 41–50 years ($p = 0.95 > 0.05$) are not statistically significant.

An analysis of subject-wise teachers' OTL efficacy reveals that science teachers have the best online teaching efficacy ($M = 47.44$, $SD = 2.5$) followed by social science ($M = 44.52$, $SD = 7.5$), humanities ($M = 40.48$, $SD = 4.2$) and physical and work education (PW) ($M = 35.48$, $SD = 3.4$). This difference has been presented with the help of the mean-plot analysis in Figure 7 below.

A one-way ANOVA was conducted to find statistical significance of these differences of efficacy among different subject groups of teachers and the results are reported in Table 6 that finds statistically significant difference ($p = 0.000 < 0.05$). This outcome indicates there are reasons behind such differences than being a mere chance though these reasons were not investigated in this study.

This significant difference demands a post hoc comparison and the summary of which has been presented in Table 7 below. The outcomes of Levene's statistics ($p = 0.000 < 0.05$) show data meet the assumption of homogeneity of variances, hence, Tukey's honestly significant difference (HSD) post hoc test was used.

The above post hoc analysis reveals that difference between humanities and science ($p = 0.000 < 0.05$), humanities and social science ($p = 0.019 < 0.05$), humanities and PW ($p =$

Table 4.
One-way ANOVA
comparing OTL
efficacy among four
age groups of
teachers

Groups	Sum of squares	df	Mean square	F	Sig.
Between groups	686.273	3	228.758	6.204	0.001*
Within groups	3,539.687	96	36.872		
Total	4,225.960	99			

Note: * $p < 0.05$

Dependent variable: *teacher self-efficacy*
Games-Howell

(I) Age group	(J) Age group	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
20–30	31–40	1.067	1.505	0.893	–2.91	5.05
	41–50	6.667*	2.260	0.040	0.26	13.07
	>50	5.385*	1.582	0.007	1.19	9.58
31–40	20–30	–1.067	1.505	0.893	–5.05	2.91
	41–50	5.600	2.270	0.100	–0.83	12.03
	>50	4.318*	1.596	0.044	0.08	8.55
41–50	20–30	–6.667*	2.260	0.040	–13.07	–0.26
	31–40	–5.600	2.270	0.100	–12.03	0.83
	>50	–1.282	2.321	0.945	–7.81	5.25
>50	20–30	–5.385*	1.582	0.007	–9.58	–1.19
	31–40	–4.318*	1.596	0.044	–8.55	–0.08
	41–50	1.282	2.321	0.945	–5.25	7.81

Table 5.
Post hoc analysis of
teachers' OTL
efficacy among four
age groups

Note: * The mean difference is significant at the 0.05 level

Figure 7.
Mean plots of subject
wise teachers' self-
efficacy

Table 6.
One-way ANOVA
comparing OTL
efficacy among four
subject groups of
teachers

Groups	Sum of squares	df	Mean square	F	Sig.
Between groups	2,019.080	3	673.027	29.277	0.000*
Within groups	2,206.880	96	22.988		
Total	4,225.960	99			

Note: * $p < 0.05$

Table 7.
Post hoc analysis of
teachers' OTL
efficacy among four
subject groups

Dependent variable: <i>teacher self-efficacy</i>						
Tukey HSD						
(I) Subject taught	(J) Subject taught	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Humanities	Science	-6.960*	1.356	0.000	-10.51	-3.41
	Social science	-4.040*	1.356	0.019	-7.59	-0.49
	PW	5.000*	1.356	0.002	1.45	8.55
Science	Humanities	6.960*	1.356	0.000	3.41	10.51
	Social science	2.920	1.356	0.144	-0.63	6.47
	PW	11.960*	1.356	0.000	8.41	15.51
Social science	Humanities	4.040*	1.356	0.019	0.49	7.59
	Science	-2.920	1.356	0.144	-6.47	0.63
	PW	9.040*	1.356	0.000	5.49	12.59
PW	Humanities	-5.000*	1.356	0.002	-8.55	-1.45
	Science	-11.960*	1.356	0.000	-15.51	-8.41
	Social science	-9.040*	1.356	0.000	-12.59	-5.49

Note: *The mean difference is significant at the 0.05 level

0.002 < 0.05), science and PW ($p = 0.000 < 0.05$), social science and PW ($p = 0.000 < 0.05$) are statistically significant but science and social science ($p = 0.14 > 0.05$) is not statistically significant.

Urban school teachers found higher efficacy for OTL ($M = 43.55$, $SD = 5.9$) than teachers of rural schools ($M = 40.21$, $SD = 6.8$). A t -test was conducted to compare these two means and the results are reported in Table 8 below which finds a statistically significant difference ($p = 0.01 < 0.05$), meaning this difference was not a chance rather there are reasons behind this.

The private school teachers' OTL self-efficacy level ($M = 42.95$, $SD = 5.7$) is found stronger than their counterparts in the government schools ($M = 41.72$, $SD = 6.7$) though this difference was found statistically not significant ($p = 0.41 > 0.05$) as per the t -test result in Table 9 below.

Finding relating to Request question 2

The descriptive statistics in Table 10 reports Indian secondary school teachers' perceptions of OTL infrastructure for online teaching-learning that reveals overall perception ($M = 36.61$, $SD = 8.2$) is moderately low.

The corresponding frequency distribution histogram of the OTL perception scores presented in Figure 8 shows an approximately a normal distribution and is slightly positively skewed ($Skp = 0.061$) that indicates more individuals in the group score less than the average score for their group which is further explained through the Mode score (28) < Mean (36.61). This fetches the conclusion that teachers' overall OTL perception shows a trend ranging from medium to low as per the measurement scale (Minimum = 12, Maximum = 60) used in this study.

Table 8.

t -test comparing OTL efficacy of urban and rural school teachers

Variable		Levene's test for equality of variances		t -test for equality of means				
		F	Sig.	t	df	Sig. (two-tailed)	Mean difference	Sth. error difference
Teacher self-efficacy	Equal variances assumed	1.65	0.201	2.622	98	0.010	3.33	1.27
	Equal variances not assumed			2.600	92.00	0.011	3.33	1.28

Table 9.

t -test comparing OTL efficacy of private and government school teachers

Variable		Levene's test for equality of variances		t -test for equality of means				
		F	Sig.	t	df	Sig. (two-tailed)	Mean difference	Std. error difference
Teacher self-efficacy	Equal variances assumed	1.39	0.241	-0.766	98	0.446	-1.231	1.607
	Equal variances not assumed			-0.830	35.39	0.412	-1.231	1.482

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29,4

Table 11 further shows a decent difference between male and female teachers in respect of their perception of OTL infrastructure where male teachers exhibit a better perception (M = 39.51, SD = 8.1) than women (M = 32.25, SD = 6.14). The *t*-test analysis in Table 6 shows this difference is statistically significant as well ($p = 0.000 < 0.05$).

358

Table 10.
Descriptive statistics
of teachers’
perception of OTL
infrastructure

N	Valid	100
	Missing	0
Mean		36.61
Median		35.00
Mode		28 ^a
Std. deviation		8.161
Skewness		0.061
Std. error of skewness		0.241
Minimum		23
Maximum		50

Figure 8.
Histogram of
teachers’ OTL
perception scores

Table 11.
t-test comparing
OTL infrastructure
perception of male
and female teachers

		Levene's test for equality of variances		<i>t</i> -test for equality of means				
Variable		F	Sig.	<i>t</i>	<i>df</i>	Sig. (two-tailed)	Mean difference	Std. error difference
ICT infrastructure perception	Equal variances assumed	9.081	0.003	4.829	98	0.000*	7.267	1.505
	Equal variances not assumed			5.097	96.240	0.000	7.267	1.426

Note: * $p < 0.05$

A palpable difference among several age groups also found when the 20–30 years age group finds the strongest perception regarding OTL ($M = 39.88$, $SD = 7.9$) followed by 31–40 years age group ($M = 38.6$, $SD = 8.1$), 41–50 years age group ($M = 32.67$, $SD = 8.4$) and above 50 years group ($M = 32.12$, $SD = 5.8$). This outcome indicates that teachers' OTL perception shows a decreasing trend with the increase in their age and this has been further made evident in the mean plot analysis in Figure 9 below.

The one-way ANOVA results in Table 12 show the above differences among four age groups of teachers are statistically significant ($p = 0.000 < 0.05$) implying that there are reasons behind this difference than being a mere chance.

As the differences among age groups were found significant a post hoc analysis was also conducted and the results are reported in Table 13 below.

The data does not meet the assumption of homogeneity of variances as per Levene's statistics ($p = 0.56 > 0.05$), hence, the Games Howell test post hoc test was used. The analysis displays that the differences between the groups 20–30 years and above 50 ($p = 0.000 < 0.05$), 31–40 and above 50 years ($p = 0.005 < 0.05$), are statistically significant but the differences between 20–30 years and 31–40 years ($p = 0.92 > 0.05$), 20–30 and 41–50 years ($p = 0.08 > 0.05$), 31–40 and 41–50 years ($p = 0.19 > 0.05$), above 50 and 41–50 years ($p = 0.99 > 0.05$) are not statistically significant.

An analysis of subject-wise teachers' OTL infrastructure perception reveals that science teachers find the strongest OTL infrastructure perception ($M = 43.88$, $SD = 4.8$) followed by

Figure 9.
Mean plots of age group wise teachers' OTL infrastructure perceptions

Groups	Sum of squares	df	Mean square	F	Sig.
Between groups	1,171.769	3	390.590	6.916	0.000*
Within groups	5,422.021	96	56.479		
Total	6,593.790	99			

Notes: * $p < 0.05$

Table 12.
One-way ANOVA comparing OTL infrastructure perception among four age groups of teachers

Table 13.
Post hoc analysis of
teachers' OTL
infrastructure
perception among
four age groups

Dependent variable: <i>ICT infrastructure perception</i>						
Games-Howell						
(I) Age group	(J) Age group	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
20–30	31–40	1.275	2.026	0.922	–4.08	6.63
	41–50	7.208	2.795	0.080	–0.66	15.08
	>50	7.760*	1.795	0.000	3.01	12.51
31–40	20–30	–1.275	2.026	0.922	–6.63	4.08
	41–50	5.933	2.839	0.191	–2.03	13.89
	>50	6.485*	1.861	0.005	1.55	11.42
41–50	20–30	–7.208	2.795	0.080	–15.08	0.66
	31–40	–5.933	2.839	0.191	–13.89	2.03
	>50	0.551	2.678	0.997	–7.11	8.21
>50	20–30	–7.760*	1.795	0.000	–12.51	–3.01
	31–40	–6.485*	1.861	0.005	–11.42	–1.55
	41–50	–0.551	2.678	0.997	–8.21	7.11

Note: *The mean difference is significant at the 0.05 level

social-science (M = 37.24, SD = 10), humanities (M = 36.24, SD = 5.01) and PW (M = 29.08, SD = 3.4). This difference has been presented with the help of the mean-plot analysis in Figure 10 below.

The one-way ANOVA results in Table 14 report these differences are statistically significant ($p = 0.000 < 0.05$). This outcome indicates there are reasons behind such differences than being a mere chance though these reasons were not investigated in this study.

As the differences among subject groups were found significant a post hoc analysis was also conducted and the results are reported in Table 15 below.

Figure 10.
Mean plots of subject
group wise teachers'
OTL infrastructure
perceptions

The data does meet the assumption of homogeneity of variances as per Levene's statistics ($p = 0.000 < 0.05$), hence, Tukey's HSD post hoc test was used. The analysis reveals that the difference between humanities and science ($p = 0.000 < 0.05$), humanities and PW ($p = 0.001 < 0.05$), science and social science ($p = 0.94 > 0.05$) are not statistically significant.

Urban school teachers are found stronger perception of OTL infrastructure ($M = 38.36$, $SD = 8.2$) than the teachers of rural schools ($M = 34.64$, $SD = 7.7$). The t -test analysis in Table 16 finds this difference statistically significant ($p = 0.022 < 0.05$).

Groups	Sum of squares	<i>df</i>	Mean square	F	Sig.
Between groups	2,752.190	3	917.39	22.93	0.000*
Within groups	3,841.600	96	40.02		
Total	6,593.790	99			

Notes: * $p < 0.05$

Table 14.
One-way ANOVA comparing OTL infrastructure perception among four subject groups of teachers

Dependent variable: <i>ICT infrastructure perception</i>						
Tukey HSD						
(I) Subject taught	(J) Subject taught	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
Humanities	Science	-7.640*	1.789	0.000	-12.32	-2.96
	Social science	-1.000	1.789	0.944	-5.68	3.68
	PW	7.160*	1.789	0.001	2.48	11.84
Science	Humanities	7.640*	1.789	0.000	2.96	12.32
	Social science	6.640*	1.789	0.002	1.96	11.32
	PW	14.800*	1.789	0.000	10.12	19.48
Social science	Humanities	1.000	1.789	0.944	-3.68	5.68
	Science	-6.640*	1.789	0.002	-11.32	-1.96
	PW	8.160*	1.789	0.000	3.48	12.84
PW	Humanities	-7.160*	1.789	0.001	-11.84	-2.48
	Science	-14.800*	1.789	0.000	-19.48	-10.12
	Social science	-8.160*	1.789	0.000	-12.84	-3.48

Notes: *The mean difference is significant at the 0.05 level

Table 15.
Post hoc analysis of teachers' OTL infrastructure perception among four subject groups

		Levene's test for equality of variances		<i>t</i> -test for equality of means				
Variable		F	Sig.	<i>t</i>	<i>df</i>	Sig. (two-tailed)	Mean difference	Std. error difference
ICT infrastructure perception	Equal variances assumed	0.534	0.467	2.32	98	0.022	3.72	1.60
	Equal variances not assumed			2.33	97.75	0.022	3.72	1.59

Table 16.
t-test comparing OTL infrastructure perception of urban and rural school teachers

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The private school teachers' OTL self-efficacy level ($M = 38.29$, $SD = 8.08$) is found stronger than their counterparts in the government schools ($M = 36.16$, $SD = 8.2$) though this difference was found statistically not significant ($p = 0.41 > 0.05$) as per the t -test result in Table 17 below.

362

Finding relating to request question 3

To find out the predictive effect of teachers' self-efficacy on their OTL infrastructure a simple linear regression analysis was conducted with efficacy as the independent variable and OTL infrastructure as the dependent variable. The results are presented in Table 18 below.

The above regression analysis reports that the two variables are found to have a high positive correlation between them ($R = 0.8$) and the relationship is statistically significant ($p < 0.000$). As the ANOVA result finds significant the regression equation is valid and statistically significant ($p < 0.05$). Teachers' OTL self-efficacy puts a statistically significant effect on their perception of OTL infrastructure [$F(1, 98) = 172.003$, $p < 0.000$], with an R^2 of 0.64 indicating the 64% of the variance in the dependent variable that the independent variable explains significantly which has further been discussed with the help of the scatter plot analysis in Figure 11 below.

Finally, it can be inferred that when efficacy is the only predictor, the teachers' perception of OTL infrastructure is expected to be affected as per the following formula that shows for every 1 standard unit increase in teacher efficacy their OTL perception will be increased by 0.997 unit.

$[OTL\ infrastructure\ perception = -5.34 + (0.997)\ self\ efficacy]$.

Discussion

The current study found Indian secondary school teachers' overall OTL self-efficacy was moderate to slightly high having a lot of space for further improvement. Besides, it varies depending on different socio-demographic subgroups like male teachers showed stronger efficacy than women, urban school teachers showed stronger efficacy than their

Table 17.
t-test comparing infrastructure perception of private and government school teachers

Variable		Levene's test for equality of variances		t-test for equality of means					
		F	Sig.	<i>t</i>	<i>df</i>	Sig. (two-tailed)	Mean difference	Std. error difference	
ICT infrastructure perception	Equal variances assumed	0.093	0.760	-1.059	98	0.292	-2.121	2.002	
	Equal variances not assumed			-1.066	31.733	0.295	-2.121	1.990	

Table 18.
Summary of simple regression analysis for efficacy predicting teachers' OTL perception

Sl. No.	Predictors	<i>R</i>	<i>R</i> ²	<i>F</i> (1, 98)	Sig.	<i>B</i>	β	<i>t</i>	<i>p</i>
1	Constant	0.798	0.64	172.002*	0.000*	—	—	—	—
	OTL perception	—	—	—	—	-5.34	—	-1.62	0.108
Note: * <i>p</i> < 0.05						0.997	0.798	13.12	0.000*

Figure 11.
Scatter plot analysis
of the simple
egression equation

counterparts in rural schools, considering age groups teachers between 20–30 years showed the highest level of efficacy when 41–50 years group showed the lowest and science teachers were found having strongest efficacy followed by social science, humanities and PW teachers. Private school teachers showed stronger self-efficacy than government school teachers though this difference was found statistically not significant. All these points out the fact that there was a palpable difference in efficacy level among teachers across the country which inspired them in varying degrees to put their efforts in front of challenges which also supports our earlier studies (Kundu *et al.*, 2020; Kundu *et al.*, 2021) made in the Indian context. These findings are very important because they will help to understand the varying degree of supports, they need to accomplish their task effectively. For example, female teachers need more supports, feedbacks, training, encouragement and understanding to raise their efficacy level; than male teachers. Similarly, aged teachers need more support than the new younger teachers, PW teachers or humanities teachers need more psychological support than science or social science teachers. Thus, the policymakers can frame their policies targeting the different needs of teachers belonging to different groups.

OTL infrastructure and deep digital divide excruciating in this country (as already mentioned in several past studies such as Thirumurthy and Sundaram, 2003; Bharadwaj, 2007; Gupta and Haridas, 2012; Prasad, 2013; Netragaonkar, 2015; Kundu and Dey, 2018; Kundu, 2018; Bindu, 2019) is one such challenge that has been studied in this investigation in the light of teachers' self-efficacy. Still, few teachers have been putting their best efforts against all odds to take online classes keeping the wheel education going as reported in several contemporary reports already discussed in the literature like ANI (2020) and Fernandes (2020). It indicates their high self-efficacy driving them to fight hard that supports the view of Bandura (1986) that the greater the level of self-efficacy greater the effort, perseverance and elasticity to defend against adversities. However, this fighting spree is not present among all teachers. Maximum teachers are not taking online classes at all and the majority of them are government school teachers. The researchers felt a big problem in collecting teachers who have been taking online classes during this pandemic lockdown

because the majority was found ignoring it despite having government instruction to take classes online. Private school teachers excel here maybe this due to their job compulsion and extreme pressure from their management side. Teachers' overall perception of OTL infrastructure was also found moderate to low which is not satisfactory for online classes and palpable difference in perception was also found among different socio-demographic variables. Male teachers found better OTL infrastructure than women, Urban teachers felt better infrastructure than rural, teachers in the age group of 20–30 years found having the best perception and teachers above 50 years were found the lowest and science teachers found having the best perception followed by the social science, humanities and PW teachers. Private school teachers also found better OTL infrastructure than their counterparts in government schools though it was not statistically significant. Thus, a poor OTL infrastructure across the country is palpable though it varies from place to place and human to human. It was found that teachers having high self-efficacy had a stronger perception regarding OTL infrastructure than those who had a low efficacy. The rationale behind these finding is that it reports the clear hints toward infrastructural supports different segment of teachers need. For example, female teachers need more support than men or rural school teachers need more supports than teachers in urban schools. Besides, it shows among other factors self-efficacy was there influencing their infrastructure perception as it was supposed to sustain teachers among all challenges as claimed in [Bandura \(1997\)](#), [Chiu and Tsai \(2014\)](#), [Song *et al.* \(2011\)](#) and [Kundu \(2020\)](#).

This unprepared and insufficient infrastructure has also been evident from the responses of the teachers during interviews. All 30 participants said they do find sufficient infrastructure for taking online classes. They unanimously said lack of devices and the internet is the most acute problem against students' participation in online classes. Among other problems, they mentioned lack of interest among students and guarding toward online classes, lack of technology skills, inability to recharge their connection in time and poverty, uncertain electricity in rural areas making their phones without charge, the single device in the family, etc. In total, 80% of teachers said they found below 30% student attendance for online classes when the rest 20% said it was around 50%. Thus, overall students' attendance in online classes was very poor. As a reason, the observation of a teacher is worth mentioning here as follows:

[I] feel the majority of our students do not have a smart device or internet access at home which is the biggest hurdle in OTL with the students, and due to this sudden COVID outbreak and eventual lockdown, schools could not take necessary measures to strengthen their infrastructure.

All 15 government school teachers said they were not satisfied with the support their schools providing them your online classes and a mixed approach was observed from the private school teachers on this question, eight said they were not satisfied while seven teachers said they were satisfied with their schools supports for OTL. These points also point out better institutional support from private schools giving their teachers for online classes. However, teachers sounded unanimous in their conviction that online classes were as effective as F2F classes provided a student attended it thoroughly. The remark of one teacher is worth mentioning here as follows:

[online] teaching could be as effective as F2F but in India poor infrastructure for OTL obstacles its benefits to flourish. We have efficacy but we lack infrastructure. Our students have neither good device nor internet, then how could they join online. Still, we are struggling our best.

This particular observation is the essence of this study. The remark full of self-belief and confidence made us think is it practically possible to overcome the unsurpassed OTL

infrastructure hurdles strengthening teachers' self-efficacy? Another convincing remark in this respect also needs a mention here as follows:

[I] think nothing can stop a teacher from teaching his students, and obviously, COVID has put a deep impact on our traditional system, but I feel this jolt is not so deep and we will overcome and adapt to this new normal of teaching online.

The empirical data also statistically found that the self-efficacy of teachers is effective in bringing positive changes in their perception of OTL infrastructure. Earlier, before the outbreak of COVID-19 the authors in another study found both these variables were positively correlated ([Kundu *et al.*, 2020](#)) but in this study through the regression analysis, the authors found efficacy puts a significant prediction over OTL infrastructure perception to a good extent. For each 6.36 unit increase of OTL self-efficacy of the teachers brings one unit increase in their OTL infrastructure perception following the understated regression equation. The act is difficult yet possible when in a country like India where OTL infrastructure cannot be improved substantially overnight especially when the country is almost bogged down economically to face other challenges of COVID-19, in this situation resorting to teachers' self-efficacy could be a good alternate to bring effective online education. This is further supported in the several confident responses of the teachers during interviews like as follows:

[It] is too early to dream that India could develop a school system where students and teachers could have an online interaction since the country is still bogged downhearted with the enormous pressure to give the basics to its huge 1.4 billion population in this pandemic along with the murky economic recession.

This finding supports TAM 3 in [Venkatesh and Bala \(2008\)](#) adopted as the theoretical framework in this study that teachers' self-efficacy is a predictor of their ease of technology use and a positive correlation exists between the two. Besides it supports Bandura's SCT that human functioning is the mutual combination of cognitive/personal, behavioral and environmental supports. Self-efficacy as a personal factor was found to effect OTL infrastructure perception, an environmental factor. So far, as the possibilities of enhancing teachers' self-efficacy are concerned, [Bandura \(1997\)](#) has hinted at its possibilities through four sources of self-efficacy – performance accomplishments, vicarious experience, social persuasion and physiological and emotional states. Using these hints [Kundu \(2020\)](#) proposed a framework to strengthen participants' online self-efficacy along with detailed policy measures to implement the proposed framework. Taking cues from few internally inspired teachers effectively fighting against this hard time in their ways giving little care to the infrastructural poverty, other teachers could be inspired to follow the same track because efficacy is potent to face any adversaries as many past studies have reported and discussed in the literature such as [Ipek *et al.* \(2018\)](#), [Betoret \(2006\)](#), [Klassen and Chiu \(2011\)](#), [Chaplain \(2008\)](#) or [Bandura \(1997\)](#).

Conclusion

This empirical study offered an opportunity for teachers to share their views by offering a snapshot of their subjectivity regarding the move of classes online and the results here offer thought-provoking teacher reflections and subjectivity about online classes which can be summed up “we have efficacy but lack infrastructure.” This conviction gets quantitative support that it is their efficacy that makes them work amidst odds. Indian secondary school teachers have fallen into a dilemma where they have been told by the authority to take online classes but most teachers find it is difficult to continue online classes as the majority of students do not have a device, no network connection and no

positive encouragement from the school authorities, still, the teachers found struggling to keep the candle of learning flamed in this hard time of new normal. Overall, the results of our study suggest that teachers are not a homogeneous group concerning their reported readiness for online teaching yet. Men were found to have higher efficacy than women, urban teachers also having higher efficacy than their rural counterparts, aged teachers showed lower efficacy in comparison to younger teachers and private school teachers showed higher efficacy than government schools. The same law covers teachers' perception of OTL infrastructure, as two variables are in high positive correlation ($r = 0.8$). These differences hint at different subgroups of teachers exist which may require different approaches for support and refreshment. Identifying such profiles is key to making visible the heterogeneity between teachers and, ultimately, facilitate tailored support for implementing OTL. Most significantly, the study found that the effect of teacher efficacy on their perception of OTL infrastructure is statistically significant and 64% of the dependent variable that is OTL perception have been found affected by the independent variable, teacher efficacy. It found that teachers having higher efficacy find a better perception of infrastructure, which points out to the fact by strengthening teachers' efficacy level may improve their perception and outlook toward OTL infrastructure involving them in finding ways how to overcome this infrastructural lag with new thoughts, innovation and ways.

Pedagogical implications

The major pedagogical implication of this study lies in the fact that teachers' self-efficacy could be a viable option in the absence of suitable OTL infrastructure to continue online education and to secure quality assurance among the stakeholders. The efficacy has been found to have a deep positive prediction on the teachers' perception of OTL infrastructure which supports the theoretical scaffolding in the study. Thus, the developing countries like India suffering from a deep economic crisis to tackle this unprecedented pandemic may resort to counseling their teachers with the proper policy framework and can be instrumental in driving out the best from them. This needs to be done as a compulsion because the coming future is very uncertain, we do not know when we get relieved from this pandemic or a new one may not knock at our doors. So online education is going to be the future mode of instruction, and hence, a massive preparation needs to start without further delay and this study is going to present a new vista of alternate for unsurpassed infrastructure hurdles for the time being. Teachers when pushed by their inner drive and self-efficacy, have been found to overcome the poor internet connection in several exceptional ways. Though this perception is not general still few teachers were found following this path of difficulties and we are to make it common in every teacher and then only the country will flourish with quality assured OTL practice. So far, social implications are concerned the outcomes of this investigation show the potential to recover the developing societies from the acute crisis in an education system that prolong school closer has inflicted on them by the COVID-19 pandemic.

Insight for future practices

As it has already mentioned in several past studies made before the COVID-19 outbreak that OTL is a matter that only exists in papers in India, its importance was limited in theories having very poor utilization and the country has not yet developed a sound infrastructure for OTL, still, this study went out to review the current situation as it is an emergency and country is working on emergency mode to cater the minimum needs of all sections and has been taking several measures to shift country's education from F2F to online. Given that, readiness may have additional components (Hung, 2016), we encourage researchers to extend the representation and measurement of this concept in future studies. Such

extensions could include other human factors as mentioned in Bandura's (1986) SCT besides efficacy, but are not limited to participation in teachers' professional development (Lidolf and Pasco, 2020), teachers' expectancy and value beliefs (Cheng *et al.*, 2020) or performance-based TAM measures. Moreover, in this study, we aimed at measuring TAM in the context of the current situation (i.e. transition to OTL in school education due to the COVID-19 pandemic) which needs further studies in a normal situation as well. We assessed teachers' views and readiness, the respective individual and contextual characteristics at only one measurement occasion. The statistical differences found among several demographic variables need to be investigated in future studies to initiate adequate teacher support measures.

Limitations

The time was not appropriate for research because unusual time tends to give unusual results owing to several extraneous variables as there may be in this case. The pandemic may affect the outcomes of this study by affecting teachers' beliefs or attitudes which is bound to affect the precision of results. This is a major limitation of this study. Besides, the survey was targeted to include 200 participants within the small capacity of the researchers of which only 100 was finally counted upon. The response rate was only 50% which was also unusual. The outcomes were generalized based on their responses naturally there are chances of limitation owing to the small sample size in a country like India. Besides, the lockdown situation and social distancing measures may hamper the respondents to respond freely and cooperatively to the researchers.

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